moving the wax from the branches of the tree and of preparing it for market was then explained. Thereafter Mr. Hosie detailed the result of an examination of the insects after the wax had been fully deposited, and finally passed to the annual quantity of insect white wax produced, its value and uses.—*English Mechanic.*

PALPI OF INSECTS.—Examination of above fifty individuals of diverse forms of Orthoptera and Coleoptera have caused M. F. Plateau to reach the following conclusions respecting the use of the palpi: (1) During the act of eating they remain inactive. (2) Deprivation of the maxillary palpi does not hinder the insects from eating as usual. (3) Loss of the labial palpi has no more effect. (4) Smell remains the same after the four palpi are taken away. (5) The amputation of all the palpi does not prevent these insects from recognizing and seizing their food. (6) Loss of all the palps does not prevent them from feeding as usual.

ENTOMOLOGICAL NEWS.—We have received from Dr. G. Mayr a detailed work on fig insects, consisting of 105 closely-printed pages, with three excellent plates.——Dr. J. A. Lintner, the State entomologist of New York, has issued a lecture on cut-worms, read before the State Agricultural Society in January last.——One of the most valuable contributions to entomology of the year is Mr. Poulton's "Farther notes on the markings and attitudes of lepidopterous larvæ, together with a complete account of the life-history of *Sphinx ligustri* and *Selenia illunaria*," in the second part of the Transactions of the Entomological Society of London, for 1885. Among the topics discussed in this paper are the following: The utilization of the changes in color before pupation for protective purposes, and an anatomical reason for the special protection of larvæ, wherein the author shows that the various means of protection in larvæ are always of a passive kind. When active (flagella) they seem to be directed against the attacks of ichneumons, which produce fatal results in quite another way. "Nearly all the means of defence against other enemies are such as tend to prevent the larva from being seen or touched, rarely such as to be of any avail when actually attacked." This Society has within a few months obtained a royal charter.——The death of Mr. H. K. Morrison, so well known as a zealous and successful collector, in May last, was sudden. There is a good opening for one or more efficient collectors in this country to succeed Belfrage, Boll and Morrison.

ZOÖLOGY.

RECENT WORK ON BALANOGLOSSUS.—W. Bateson[1] has recently investigated the morphology of Balanoglossus, and thrown a great deal of light upon this hitherto obscure and little understood animal. A summary of his results is as follows: There is

[1] Quarterly Journal Mic. Soc. Suppl., 1885.

a spherical gastrula, large circular blastopore, later the body is elongated, the blastopore closes completely, a ring of strong cilia forms about the blastoporic area, the blastopore being placed eccentrically in the ring. The body becomes constricted by a transverse ring, a second forms behind it, and the body is thus cut off into three regions corresponding with the future proboscis, collar and body portion; the end of the proboscis is furnished with a tuft of cilia. A groove forms in the middle line of the dorsal region of the collar, and at the same time the dorsal nerve cord is delaminated from this ectoderm. At the same time a pore perforates the skin behind the collar on either side, placing the endoderm and the ectoderm in communication, and furnished with cilia, it is the first pair of gill slits. The mouth forms in front of the collar at the base of the proboscis, and later the anus arises at the opposite end of the body. In the species whose life-history is dealt with in this paper, viz., *Balanoglossus kowalevskii*, the development in the external form proceeds by the direct growth from the form now arrived at to the adult by the elongation of the body, the addition of the gill slits and the differentiation of the body region into the branchial and digestive portions, and the disappearance of the ring of cilia and the tuft of cilia upon the proboscis. There is thus no Tornaria stage included in the life-history of *B. kowalevskii*, but the development is direct. Bateson does not discuss the question of the relations between the echinoderms and Balanoglossus, reserving it for the fuller discussion that is promised in a future paper.

The history of the internal changes is briefly as follows: The endoderm was invaginated, as seen from the surface; from it arises the mesoblast in three separate masses, one anterior unpaired mass in the proboscis, two anterior lateral masses, two posterior lateral masses. These all arise as diverticula of the archenteron, and their cavity, at first continuous with that of the primitive gut, becomes the various portions of the body cavity. A forward proliferation on the dorsal side of the gut wall, with at first an opening into the gut cavity, gives rise to a solid supporting organ which runs from the collar region into the proboscis, and is the homologue of the notochord of the Chordata. The walls of the anterior unpaired body cavity is produced backward as two horns, the left comes to open to the exterior by a pore in the proboscis, the right lines the body cavity of the proboscis. The anterior pair of diverticula becomes filled almost completely, and the posterior pair form the most of the cavity of the body. In the collar region the edge of the collar posteriorly overhangs the body wall to such an extent as to partially close in a cavity there, open behind, in which the first pair of gills lie, this space is called the atrial cavity. A duct arises in a thickening in the wall of this space, and places the cavity in communication with the body cavity of the collar. Nothing is yet determined in regard to the generative system.

Balanoglossus presents resemblances, though with some difference, to Amphioxus in the following points: Origin and persistence of the notochord and its relation to the alimentary canal, position of the blood-vessels of the gills and the form of the gill bars, position and mode of origin of the central nervous system, origin of the mesoblast and body cavity, the atrial fold and the duct from body cavity into the atrium—similar to the excretory tube of Amphioxus.

The complete discussion of the affinities of Balanoglossus is reserved for a future paper, but Bateson proposes to associate it as follows:

Hemichorda	=	Enteropneusta
Urochorda	=	Ascidians
Cephalochorda	=	Amphioxus
Vertebrata.		

—*Henry Leslie Osborn.*

THE REPRODUCTION OF THE COMMON MUSSEL.—Professor W. C. M'Intosh describes the reproduction of the mussel (*Mytilus edulis*). The sexes are distinct in the adult form, but in the undeveloped condition the structure of the organs seems to be similar in both sexes. The shape of the valves gives no reliable distinction. The reproductive elements are developed in the mantle; the male presents in January, in the thickened generative region of the mantle, large pale round sperm-sacs filled with minute spermatozoa, which have minute ovoid bodies with finely filamentous tails. They are lively and tenacious of life. Twenty-four hours of exposure, however, seems to be fatal to them. The females have the same region of their mantle crowded with a prodigious number of minute ova. Throughout February the development increases, and the whole surface of the mantle becomes speckled in both sexes with the reproductive elements. After full maturity is attained, as in April, the orange mantle is richly marked in an arborescent manner by racemose sperm-sacs and ducts, especially towards the margin. In the females this is not so evident, the ova being grouped in masses and densely packed.

From this time the activity of the spermatozoa and the number of the ova diminish, till in July neither ova nor spermatozoa can be distinguished microscopically.—*Journal of the Royal Microscopical Society, June, 1885.*

MANNER IN WHICH THE LAMELLIBRANCHS ATTACH THEMSELVES TO FOREIGN OBJECTS.—Dr. J. T. Cattie describes the means by which the common mussel attaches itself to foreign objects. When the foot commences to grope about, it may become two or three times as long as the body of the animal without finding any object within its vicinity; it then moves about till it finds some point of support, when this is effected there appears from the transverse cleft which terminates the ventral groove a whitish sub-

stance which gradually becomes more opaque; sometimes the slit takes on the form of an equilateral triangle, and then the quantity of matter which exudes from it is greater; this matter obviously comes from the cylindrical tubes which are scattered in the glandular substance of the foot. A terminal plate having been formed the foot is withdrawn, and the plate and the byssus are merely connected by a delicate thread. The time necessary for an animal of average size to form the plate varies between 55 and 90 seconds; in some cases two connecting threads become developed. The terminal plate, when studied under the microscope, was found to be formed of thousands of small granules, irregularly distributed, and varying considerably in size. The fine threads appear to be formed by the agglutination of granules of various sizes, but large granules are formed by the fusion of several smaller ones.

The formation of the byssus is regarded by the author as being very simple; the walls and the lamellæ of the byssus-cavity continually secrete a byssogenous matter; the lamellæ in the anterior and narrow part of the cavity unite and fuse with one another, while the narrow shape of the orifice gives the byssus-threads their form. Owing to the relations of the ventral groove of the foot each byssus-thread is immediately fused to the main trunk.

The author doubts the correctness of A. Müller's view that there is an agglutinating and a byssogenous substance; and speaks severely of the artificial character of that author's classification of the species.—*Journal of the Royal Microscopical Society, August, 1885.*

Pulmonate Uropneustic Apparatus.—H. von Ihring[1] writes upon the morphology of the lung cavity in the Helicoidea. While in Cyclostoma, also in the Limnæida, the lung is plainly a modified gill cavity and still contains in the adult, in some form, the rudiment of the gill, in the Helicoidea the lung is not at all the remains of an old mantle cavity, but is a special cavity formed by a dilatation of the duct leading from the excretory organ to the exterior, and the breathing pore occupies precisely the place occupied by this orifice in the opisthobranchs. Semper had differed from von Ihring upon this, and claimed that the lung was a modified gill cavity, so von Ihring made observations upon a number of forms, among them Onchidium and Vaginulus. These he concludes to be the lowest forms in the Helicoid phylum, forms from which the helicoids have been derived, and further forms which, derived from marine ancestors, have been adapted to an amphibious habit and given rise to descendants wholly air-breathing. There is in Onchidium not the slightest trace of a gill in the lung cavity, and this is situated at the end of the meter. This paper opposes the view of Borgh that Onchidium is a pul-

[1] Zeitsshr. f. w. Zool. 41, p.259, 1885.

monate adapted from a terrestrial to an amphibian mode of life. —*Henry Leslie Osborn.*

HELIX CANTIANA AT QUEBEC.—Few accessions from abroad to our lists of land shells having lately been recorded, the discovery in Canada of a large colony of a foreign species, not previously known to occur on this continent, is of more than ordinary interest. When at the ancient capital recently, in ascending the steps from Dufferin terrace to the citadel, I stopped to recover breath on a stage considerately provided for such purposes, at a point at about thirty feet from the summit of the glacis. From this resting place a path, trodden only by goats and equally sure-footed Quebec gamins, leads upward in a westerly direction along the steep and narrow slope between the south walls of the citadel and the almost perpendicular rock on which it stands. Noticing a small helix moving on the path, I passed under the guard-rail and ventured out upon it, not indeed wholly without fear, as there was danger, in case I slipped, of falling into Champlain street, four hundred feet below. The shell, which proved to be *Helix rufescens* Pennant, was found in abundance, in company with numerous *Limax agrestis* L., clustering around the roots and climbing the stems of a tall, rank weed, apparently a species of Ambrosia. An occasional specimen of a larger shell, which I supposed to be immature *H. hortensis*, was also found at intervals along the path; and directly above where Montgomery fell, it occurred in considerable numbers in scattered clumps of grass which had obtained a foothold on the shaly cliff. It seemed strange to me that among the many shells no mature *H. hortensis* could be observed; but thinking it could be no other species, I was content with collecting about a dozen specimens, though I might readily have obtained hundreds; and picking my steps carefully back to the point of departure, gave the shells no further thought until after my return to Ottawa. When preparing the *H. rufescens* for the cabinet, I examined with more care than previously the associated shell, and surmising that, instead of immature *H. hortensis*, it was *H. cantiana* Montague, proceeded to compare it with specimens of the latter species received some years ago from Mr. Hey, of York, England, and with the description and figure given in Jeffreys. The comparison at once removed all doubt of the identity of the Quebec shell. It lacks in general the rufous concentric line conspicuous on the body whorl of the English specimens of *H. cantiana*, and is somewhat smaller; but has the reddish band around the aperture, and is in every other respect the same. I have described the locality in which it is found with some minuteness, in order that visitors to Quebec may obtain specimens, if they think it worth the trouble. I might add that it was a warm, moist evening when I found the shells.—*Frank R. Latchford, Ottawa. Ont.*

RATS NESTING IN TREES.—In the neighborhood of New Almaden, Santa Clara county, Cal., I observed, during August of this year (1885), that in many of the small oaks there were masses of twigs, some of the masses as large as a bushel measure. On examination I found that each of the twigs showed evidence of having been gnawed off by some rodent. These nests proved to be inhabited by a species of rat about the size of the domestic rat, but finer looking, and with larger ears. They probably belong to the genus Neotoma of Say and Ord. The rat that builds a conical nest on the ground, of twigs and branches to the heighth of two or three feet, is probably of the same species as this living in the trees, as I found the nests of the two near together, and sometimes a nest would be half on the ground and half in the tree. —*H. W. Turner, U. S. Geol. Survey.*

PRELIMINARY NOTE ON THE ORIGIN OF LIMBS.—From my studies on the limbs of vertebrates I get the following results:

1. There exists no "homodynamie" between the skeleton of the gills and the limbs (Thatcher, Mivart, Balfour, v. Rautenfeld, Dohrn).

2. The original form of the paired fin is like that of the unpaired, and consists of parallel rays vertical to the axis of the body on a horizontal plane (Thatcher, Mivart, etc.).

3. These rays unite proximally to form the *basipterygium*, which turns out, forming the posterior border of the fin, the *metapterygium* (Balfour).

4. The extremities of the higher vertebrates have originated directly from the fin by a rotation of the latter through 180° in the direction of the hands of the clock.

5. The extremities of the higher vertebrates have originated by reduction of the propterygium and mesopterygium and the following rays of the metapterygium.

6. A line drawn through humerus, radius, radiale, carpale$_1$, metacarpale$_1$, digit$_1$ in the urodelous batrachians corresponds to a line along the basipterygium, or the first ray of the metapterygium.

7. The oldest known extremities of the higher vertebrates are seen in the Menopomidæ, in Salamandrella and Ranodon, among the batrachians (two central bones), in Plesiosaurus, Pliosaurus, Baptanodon (Sauranodon, rudiments of ulnar rays ["olecranon"]). A fact of great interest is the presence of *two central bones* in *the carpus of the Rhynchocephalia* (Hatteria, Proterosaurus) never observed before.

8. The reduction of radial rays in the higher vertebrates is a secondary condition produced by the adaptation to a terrestrial life.—*Dr. G. Baur, Yale College Mus., New Haven, Conn., Oct. 2, 1885.*

ZOOLOGICAL NEWS.—*Protozoans.*—Dr. R. Blanchard (Bull. de la Soc. Zool. de France), in an article modestly entitled, "Note sur le Sarcosporidies," gives the history of our knowledge of these parasites from their first discovery by Miescher in the muscles of a mouse to the present time, and presents an essay upon their clasification. These Sporozoa or Sarcosporidia are intimately related to Coccidium and especially to Klossia. They have been found in the mouse, the pig, the horse, the ox, the sheep, the dog, the cat and the rabbit, and more rarely in those of man. Virchow has noticed that they produce no change in the muscular tissue. As they occur in the ape, it is clear that man is not safe from them, and Lindemann has described them from the valves of the human heart. As they enter the system by the digestive canal, the practice of cookery explains their comparative rarity in man.——At the Académie de Sciences of Paris, M. A. M. Edwards presented a note of M. de Folin, relating a curious form of reticulated rhizopod which inhabits what seems to be small pebbles in hardness and aspect. The organism forms a sort of paste of foreign particles and sarcode and covers the whole with a secretion like that which forms the test of a porcellanous foraminifer, and is not only smooth, polished and shining, but colored in many tints. These foraminifers form the genus Lithozoa, with numerous species.——M. R. Blanchard has described a peritrichous infusorian ectoparasite of fresh-water fish. *Apiosoma piscicola* is fixed during its whole existence.

Worms.—The thesis of M. J. Porrier for degree of doctor of the faculty of sciences at Paris, has for its subject the trematodes. The structure of the skin, and the anatomy of the suckers are thoroughly treated, and details noted which need figures to be understood. The most interesting fact in relation to the digestive tube is the description of the absorbent hairs. The ciliated sac which surrounds the prostate gland and seminal receptacle seems to serve only to protect the prostate and plays no part in copulation. The canal of Laurer also, once considered a copulatory organ, is but a reservoir, so that the only probable and admissible mode of fecundation is external self-fecundation, such as Sommer admits for the cestodes. M. Porrier has also collected facts of importance relative to the structure of the nervous system. ——M. Remy Saint-Loup describes a new marine oligochete, many characters of which are analogous to those of Pachydrilus Claparede, but which is transitional between that genus and Enchytracidæa.——An examination of some tunicates collected by various arctic expeditions have been made by C. W. S. Aurivillius, in order to discover crustacean parasites. Two amphipods, *Andania pectinata* and *Aristias tumidus*, were found, together with nine copepods, six of which were new. Out of four of these our author makes two new families. As a rule a parasite seems to affect a single genus or even species.

Reptiles.—M. Le Vaillant has described a new species of land tortoise, *Testudo yniphora*, captured in or near the Comoro isles by some Arab sailors. Its carapace is highly convex, or hemispherical, the anterior and posterior apertures but slightly elevated, recalling those of *T. radiata.* The plastron has a peculiarity which enables it to be distinguished at sight from all other tortoises, and is the motive of the name given to it. In color the back is reddish-yellow with brown on the periphery of the plates, while the plastron is pale yellow.

Mammals.—An example of *Kogia breviceps*, the pigmy sperm whale, was taken in 1884 at Spring Lake, N. J. This was the first time that this rare species had been taken in the Atlantic. The specimen, like the majority of those hitherto taken, was a female. The Smithsonian Institution has just received a specimen of a male of this species, taken at Kittyhawk, N. C. Mr. True states that it is about nine feet long and apparently adult. Near the anterior end of the upper jaw are four slender curved teeth, similar to those of the lower jaw, but smaller. Two teeth are said to occur in a similar position in a specimen from India, described by Sir R. Owen as *Euphysetes simus.* The genital opening is situated anterior to the line of the front margin of the dorsal fin. The stomach contained only the beaks and eyes of cuttlefish and a great quantity of nematoid worms. A large quantity of cestoids, apparently Phyllobothrium, were found encysted in the integuments of the back, especially about the dorsal fin.——The distribution in height of the mammals around Kilimanjaro is interesting. *Cercopithecus pygerythrus* was found at an elevation of 5000 feet, and the guereza, which is very common round the base of the mountain, at 3000 feet; the lion does not ascend beyond 3000 feet, but the leopard is very common up to 7500 feet. *Genetta tigrina* occurs up to 7000 feet, and *Herpestes caffer*, though not a mountain animal, ascends as far as the village of Moshi (5000 feet), as does also *Canis lateralis. Hyrax brucei* reaches 10,000 feet; the elephant 13,000, while the buffalo, the koodoo and a Neotragus attain to 14,000 feet above the sea. *Equus burchelli* and *Rhinoceros bicornis* do not ascend beyond 2300 or 2400 feet.——The Proceedings of the Zoölogical Society of London (Part II, 1885) contain a valuable article upon the anatomy, classification and distribution of the Arctoidea, by St. George Mivart. The genera are taken up separately, and the habits, distribution, external appearance, dentition, skeletal characters and proportions of each are carefully described. The classifications of Turner and Flower are given, and the article concludes with the author's arrangement, which differs from that of Flower as follows: Ailuropus is removed from the Ursidæ and placed with Ailurus in the section Ailurinæ of the Procyonidæ. The entire Arctoidea thus fall into the three families Procyonidæ, Mustelidæ and Ursidæ.—— Dr. J. Struthers

(Jour. Anat. and Phys., January, 1881) gives the result of an examination of the bones, articulations and muscles of the rudimentary hind-limb of the Greenland right whale. Ten sets of these parts were dissected. The synovial capsule of the knee-joint, the acetabular cartilage, a synovial cavity and head of the femur are present, and an apparatus of strong ligaments is attached to the femur, permitting and restraining movements in certain directions. But these movements of the femur are limited, and in two examples the hip-joint was anchylosed without trace of disease. The muscles of these bones may be arranged in four groups, three of which connect them with other parts: (1) Internally with the genital organs; (2) a posterior or caudal mass; (3) an anterior or trunk mass; while the fourth connects the bones to each other.——According to Mr. P. L. Sclater, the wild ass of Somaliland is a new species, or at least subspecies, and is distinguished from that of the Nubian desert by its generally paler and more grayish color, the entire absence of the cross stripe over the shoulders, the very slight indication of the dorsal line, and the numerous black markings on both front and hind legs. It has also smaller ears and a larger and more flowing mane.——Mr. W. Leche (Proc. Zoöl. Soc., 1884) describes some Chiroptera from Australia, including the new species *Nyctinomus petersi* and *N. albidus*. In the latter species the ears are much larger than the head, and are united by a low band.——Mr. J. W. Clark describes (in the Proc. Zoöl. Soc.) a series of stuffed sea-lions belonging to the Australian Museum, Sydney, and from a study of these and other examples concludes that *Otaria cinerea* is "one of the four distinct species of Otaria inhabiting the Australian coast."——M. Fernand Lataste contributes to the Proc. Zoöl. Soc. for 1884, a description of a new species of Meriones, *M. longifrons*, from Arabia, together with a full account of its habits, intelligence and sexual relations. Gestation normally lasts twenty days, and the ovarian period about ten days.

EMBRYOLOGY.[1]

THE ARCHISTOME-THEORY.—The new doctrine of development, of which it is proposed to give a brief and partial sketch here, rests in part on a hypothetical basis and in part upon a well established theory founded upon observation. It consists further in an expansion and adaptation of the gastreal-theory of Haeckel in the light of more recent research, and a reconciliation of it with the deductions of His, Rauber, Whitman and myself, as to the occurrence of concresence of the lips of the blastophore and the differentiation of the axis of the body of the embryo from behind forwards, generally of bilateral types with paired mesoblastic sacks derived

[1] Edited by JOHN A. RYDER, Smithsonian Institution, Washington, D. C.